Ball, G. D. C., Sebastianski, M., Wijesundera, J., Keto-Lambert, D., Ho, J., Zanlea, I., Perez, A., Nobles, J. D., & Skelton, J. A. (2020). Strategies to reduce attrition in managing paediatric obesity: A systematic review. *Pediatric Obesity*, [e12733]. https://doi.org/10.1111/ijpo.12733

Abstract

Objective: To conduct a systematic review of the literature for strategies designed to reduce attrition in managing pediatric obesity.

Methods: We searched Ovid Medline (1946 to May 6, 2020), Ovid Embase (1974 to May 6, 2020), EBSCO CINAHL (inception to May 6, 2020), Elsevier Scopus (inception to April 14, 2020), and ProQuest Dissertations & Theses (inception to April 14, 2020). Reports were eligible if they included any obesity management intervention, included 2 to 18 year olds with overweight or obesity (or if the mean age of participants fell within this age range), were in English, included experimental study designs, and had attrition reduction as a main outcome. Two team members screened studies, abstracted data, and appraised study quality.

Results: Our search yielded 5,415 original reports; five met inclusion criteria. In two studies, families attended an orientation session as an attrition-reduction strategy before treatment enrollment; in three others, text messaging and motivational interviewing supplemented existing obesity management interventions. Attrition-reduction strategies led to decreased attrition in two studies, increased in one, and no difference in two. For the two strategies that reduced attrition, *(i)* pre-treatment orientation and *(ii)* text messaging between children and intervention providers were beneficial. The quality of the five included studies varied (*good* [n=3]; *poor* [n=2]).

Conclusion: Some evidence suggests that attrition can be reduced. The heterogeneity of approaches applied and small number of studies included highlight the need for well-designed, experimental research to test the efficacy and effectiveness of strategies to reduce attrition in managing pediatric obesity.

Introduction

In Canada, overweight and obesity are present in 27% and 13% of 3 to 19 year olds, respectively[1]. Similar (and higher) levels have been reported in many countries around the world[2]. Obesity tends to track from the pediatric to adult years[3], which can increase the risk of several common chronic diseases, including cardiovascular disease, type 2 diabetes, and some forms of cancer[4]. The high prevalence[1,2] and persistence[3] of pediatric obesity underscore the importance of effective and accessible interventions for managing obesity. Multidisciplinary, family-centred interventions that focus on healthy lifestyle habits and behaviour changes can help to manage pediatric obesity[5,6], but often require a moderate to high intervention dose delivered over an extended period[7]. Children and their families who attend more intervention sessions and remain enrolled in care for longer periods achieve the greatest improvements in weight and health[8-10]. Unfortunately, for a variety of reasons (*e.g.*, logistical barriers, unmet needs or expectations), many families discontinue obesity management interventions prematurely[11,12]. To achieve improvements in health outcomes, children benefit from remaining in treatment. As clinicians and researchers working alongside children and families, we recognize that attrition (*i.e.*, permanent discontinuation of treatment[13]) can be a very challenging and vexing issue in obesity management, limiting the potential benefits that children with obesity and their families can achieve.

In pediatric obesity management, attrition is as high as 80%[14] and 30% to 40% attrition is common[15-17]. When attrition occurs, healthcare resources are misused, clinicians are less productive, and families become discouraged and unlikely to access obesity management health services in the future[18-20]. Paradoxically, families that are most likely to discontinue obesity management are the ones who may benefit the most from continued support (*i.e.*, families living in more deprived areas, children with greater degrees of obesity)[21], thereby worsening existing health inequalities[22].

Literature reviews on factors related to attrition in managing pediatric obesity have revealed important insights. For instance, Dhaliwal *et al.*[11] documented predictors of and reasons for attrition. Their quantitative data revealed that attrition was higher in older children (≥12 years old) and among families receiving social assistance; qualitative data indicated common reasons for attrition included logistical barriers and interventions not meeting families' needs (*e.g.,* families disagreed with the treatment focus or intervention length). Initial data from the CANadian Pediatric Weight management Registry (CANPWR), an ongoing study of children enrolled in multidisciplinary obesity management[23], showed that attrition often occurs early in treatment[24]. Other reports showed that predictors of attrition differed depending on when attrition occurred (*i.e,* earlier *versus* later in treatment)[25,26]. For instance, Spence *et al.*[25] showed that higher self-assessed health of the family system was associated with lower short-term attrition (*i.e.,* up to 4-months post-baseline) whereas higher percentage of intervention sessions attended by parents was associated with lower long-term attrition (*i.e.,* from 4- to 12-months post-baseline). Nobles *et al.*[26] found that *initiators* (*i.e.,* families that attended the first one-third of a 10- to 12-week intervention) were more commonly of white ethnicity, enrolled in larger group sizes, and had April and September intervention start dates. They also reported that among *late dropouts* (*i.e.,* families that did not attend the final one-third of a 10- to 12-week intervention) included children with higher BMI Z-scores, enrolled in more recent intervention years, and that began the intervention in April.

A recent systematic review of adult obesity interventions[27] showed that financial incentives, multi-component interventions, and self-monitoring were strategies that reduced attrition, although most studies were rated low to moderate in methodological quality. To our knowledge, a similar review has not been published regarding attrition-reduction strategies in pediatric obesity. Interventions for managing adult and pediatric obesity may differ in important ways (*e.g.,* focus on individual [adult]

versus family [pediatric] changes; require individual [adult] *versus* parent/family [pediatric] participation), so there is a need for a standalone review to synthesize the available evidence regarding attrition in managing pediatric obesity. Accordingly, the purpose of our systematic review was to search and synthesize the literature for strategies designed to reduce attrition in managing pediatric obesity to inform future experimental research and obesity interventions in clinical practice.

Methods

For transparency, this research was originally conceptualized as a rapid review to synthesize information to inform a new, multi-centre collaboration to reduce attrition in several Canadian pediatric weight management clinics led by team members (GDCB, JH, IZ). The review was based on systematic review guidance established by Cochrane[28] with adaptations for a rapid approach that were based on the World Health Organization rapid review guide[29]. While writing the methods section for the rapid review manuscript, we realized the rigour of our methodological approach was very closely aligned with a systematic review, so to meet the standard of a systematic review, we searched and screened an additional electronic database and a grey literature source and updated our original search to meet the new searching timeline. No other deviations were made from our original protocol.

Search Strategy

A systematic search strategy was developed in consultation with an experienced librarian and peer-reviewed by a second librarian based on the Peer Review of Electronic Search Strategies (PRESS) guidelines[30]. We searched the following electronic databases: Ovid Medline (1946 to May 6, 2020), Ovid Embase (1974 to May 6, 2020), EBSCO CINAHL (inception to May 6, 2020), Elsevier Scopus (inception to April 14, 2020) and ProQuest Dissertations & Theses (inception to April 14, 2020). Reference lists of relevant systematic reviews identified by the database search were also screened. The

search was limited to English studies only and used a Low-Middle Income Country filter (https://data.worldbank.org/income-level/low-and-middle-income), which narrowed the scope of our search given that childhood obesity interventions and clinics are less common in these countries and any attrition-reduction strategies would have limited applicability to higher income countries given differences in family, social, economic, and environmental contexts. Citations were exported and managed in *EndNote* (version X9, Clarivate, Analytics). As an example, the details of our Medline search strategy are provided (see Supplementary Table).

Study Selection

Studies were eligible if they *(i)* included any kind of intervention for managing obesity, *(ii)* included participants between (or had a mean age that fell within) 2 to 18 year olds with overweight or obesity, *(iii)* were written in English, *(iv)* included experimental study designs (randomized controlled trials [RCTs], quasi-RCTs, pre-post, case series, and case studies), and *(v)* included prevention of attrition (*i.e.*, permanent discontinuation of treatment) as a main outcome. The academic literature includes substantial heterogeneity in the use and definition of engagement-related terms (*e.g.*, participation, adherence, attrition, drop out). For specificity, the definition of attrition that we applied in this review was based on a conceptual framework of engagement-related terms published recently by team members[13]. Some may consider our inclusion criteria to be overly conservative, but in comparison to a recent review of attrition in adult obesity[27], our criteria are more liberal. Two team members (MS and JW) undertook a two-stage screening process in *Microsoft Excel* (2015); study titles and abstracts were reviewed independently against the inclusion criteria, which was followed by a review of full texts. Discrepancies in screening decisions were resolved by discussion or with the input from a third party (GDCB).

Data Abstraction and Analysis

Data from the included studies were abstracted by one reviewer (JW) and verified by a second reviewer (MS) using a data collection form that was piloted *a priori*. Data included general study characteristics (*e.g.*, study design, research objectives), baseline participant characteristics (*e.g.*, number of participants, age, sex, mean BMI), intervention details (*e.g.*, intervention and control groups, length of follow-up), and outcomes (*e.g.*, attrition). Quantitative data were analyzed descriptively (*e.g.*, frequencies, means, proportions) and synthesized narratively, including a discussion of implications for research and clinical practice.

Quality Assessment

Quality of the included studies was assessed independently by two reviewers (MS and JW) using quality assessment tools published by the National Institutes of Health[31]. Different tools were applied based on study design (*i.e*, controlled intervention studies tool for RCTs; observational cohort tool for retrospective cohort studies; before and after study tool for pre/post studies). The quality of individual studies was rated as *good*, *fair*, or *poor* based on overall responses to the signaling questions. Any discrepancies between reviewers were resolved through discussion. As a complementary step, online registries (*e.g.*, clinicaltrials.gov) were searched to determine whether studies were registered publicly, either prospectively or retrospectively.

Results

Overview of Studies

Of the 5,415 articles retrieved by the search, five met study inclusion criteria and were included in the review (Table 1). The number of records identified at each screening stage are presented in Figure 1. Three studies were RCTs[32-34], one was a retrospective cohort study[35], and one was a pre/post study[36].

The five studies were all conducted in the context of established multidisciplinary pediatric obesity management clinics. Two studies included both children (~6 to 12 years old) and adolescents (~13 to 21 years old)[35,36], two included children[32,34], and one included adolescents[33] only. In all five studies, parents or adult caregivers participated along with their sons and daughters in family-based, multidisciplinary obesity management interventions. Three studies[33,34,36] included participants with either overweight or obesity and two[32,35] included participants with obesity only.

Strategies to Reduce Attrition

The attrition-reduction strategies included in the five studies were implemented in the treatment group either prior to initiating obesity management[35,36] or during the obesity interventions[32-34]. Two studies implemented an orientation session to reduce attrition[35,36]. Germann *et al.*[35] established a group-based, single-appointment orientation session that families completed prior to initiating obesity management, allowing program providers to share details about the structure and expectations of the cognitive behavioural therapy (CBT) intervention. At orientation, families received information packets about the intervention to emphasize the importance of making changes as a family, the requirement for both parents and children to attend weekly CBT sessions, and parents' leadership role in making and maintaining healthy habits. The one-day orientation session implemented by Zenlea *et al.*[36] included *(i)* a psychosocial, behavioural, and mental health screening for children and parents, *(ii)* an orientation video to provide an overview of treatment objectives and expectations, *(iii)* medical assessment, and *(iv)* review of screening results and recommendations to guide obesity management. Both studies included non-contemporaneous comparisons of historical data (*pre*-orientation implementation) *versus* contemporary data (*post*-orientation implementation) to determine the impact of orientation on attrition.

As for the attrition-reduction strategies that were implemented during the obesity intervention, In the experimental group, Armstrong *et al.*[32] included 12 weeks of text messaging for parents (≤3 messages/weekday) from research staff. Messaging focused on goal setting, was based on principles of motivational interviewing (MI), and complemented standard care (monthly clinic visits over 3 months), which both experimental and control groups received. Bean *et al.*[33] supplemented their standard practice with MI to enhance treatment effects. Both groups received the same lifestyle and behavioural intervention, which included biweekly counseling and education sessions with a registered dietitian and behavioural specialist, plus supervised physical activity (3x/week). Finally, in the study by de Niet *et al.*[34], researchers compared the impact of adding text messaging to one of two groups after participants completed the first three months of a 12-month CBT-based obesity management intervention. Children in the text messaging group received mobile phones to monitor their lifestyle habits and submit lifestyle tracking data on a weekly basis to study staff who replied to each message with tailored, supportive and motivating messages. In addition, children were encouraged to send an unlimited number of messages to study staff between three- to 12-months follow-up to share their successes, challenges, thoughts, and feelings.

Impact of Strategies to Reduce Attrition

Germann *et al.*[35] reported that families that began obesity management *before* they implemented an orientation session participated in treatment for a shorter duration (mean: 3.8 months) compared to their peers who started obesity management *after* orientation sessions were offered (mean: 6.4 months) ($p<0.01$). Conversely, by 15-months follow-up, Zenlea *et al.*[36] showed that percent attrition was higher in families that started obesity management *post- versus pre*-intervention groups (n=211/237 [89%] *versus* n=239/302 [79%]; p=0.002). Kaplan-Meier survival curves revealed that attrition happened often

early in treatment, with curve separation occurring later in *pre*- compared to *post*-orientation groups (median: 2.9 *versus* 2.0 months; p=0.004).

With regards to the three studies implementing attrition-reduction strategies during the obesity intervention, Armstrong *et al.*[32] observed no statistically significant effect of text messaging on attrition (experimental group: n=8/47 [17.0%]; control group: n=11/54 [20.4%]) over the course of the 3-month intervention period, although families in the experimental group attended more clinic visits than their peers in the control group (3.3 versus 2.1; p<0.001). Bean *et al.*[33] found no statistically significant group differences in attrition at either 3 (MI: 26.9%; control: 37.1%) or 6 months (MI: 51.9%; control: 65.8%), although attrition tended to be lower in the MI group. Conversely, the study by de Niet *et al.*[34] reported that children in the text messaging group were 3.25 times less likely (95% CI: 1.35, 7.86; p<0.01) to discontinue the intervention after 12 months compared to their peers who did not receive text message support.

Quality Appraisal

Quality assessment determined that the five included studies differed in quality. Three studies were assessed as *good quality* due to their use of randomization, concealed allocation, and proper analyses[32,34,36]. Two studies were assessed as *poor quality* due to a lack of reporting of randomization methods and no intention-to-treat analysis[33] and because of substantial loss to follow up[35]. Only one[32] of the studies was registered *a priori* in a public, online registry.

Excluded Articles

To complement the five articles included in our review, we summarized additional articles (n=13) that we excluded. These articles met some of our inclusion criteria but were rejected because they focused on

engagement-related outcomes (*e.g.*, attendance, adherence) that differed conceptually from attrition (Table 2). It is noteworthy that some authors described their outcome data as *attrition* or *drop out* within their articles, but upon review, the outcomes were more accurately described as appointment attendance or behavioural adherence.

Discussion

The purpose of our systematic review was to identify strategies to reduce attrition in managing pediatric obesity. In total, five individual studies met our inclusion criteria, which evaluated several strategies that were applied either before or added to obesity management interventions. Our results provide some limited evidence that attrition can be reduced; however, well-designed, prospective randomized controlled trials are needed to generate higher quality evidence to inform what, how, and for whom attrition-reduction strategies are effective in managing pediatric obesity.

Numerous studies have explored reasons for and predictors of attrition[11,12], but our review showed that very few have yet to examine strategies designed specifically to reduce attrition. Expert recommendations[37] encourage clinicians to assess families' readiness and motivation before enrolling in obesity management, an activity that was part of the orientation sessions described by Germann *et al.* [35] and Zenlea *et al.*[36]. The potential benefits of this assessment are twofold: *(i)* families receive feedback on whether their treatment motivation and expectations align with intervention requirements and probable treatment outcomes and *(ii)* families who are unlikely to be ready, willing, or able to meet the time and effort required for obesity management will decline to enroll because of high intervention demands. In theory, families that perceive a mismatch between their perceptions *versus* realities of obesity management will opt out before enrolling. This self-selection enables intervention providers to focus their time and resources on families that are best prepared to participate. The orientation sessions

and obesity management interventions described by Germann *et al.*[35] and Zenlea *et al.*[36] had some similar characteristics (*e.g.*, discuss treatment readiness and intervention expectations, emphasize lifestyle and behavioural changes in families), but only Germann *et al.*[35] reported a reduction in attrition. One possible explanation for this difference is the nature of the obesity management interventions themselves. Specifically, Germann *et al.*[35] offered a year-long, group- and CBT-based obesity management intervention that included weekly sessions for children and parents. However, when provided with detailed information at orientation about high intervention intensity and demand, some families likely declined to enroll, leaving a subset of families who may be ready and motivated to participate in obesity management. Compared to the intervention offered by Germann *et al.*[35], the lower intensity obesity management intervention described by Zenlea *et al.*[36] (*i.e.*, 1-on-1 appointments with multidisciplinary team members every 1 to 3 months) was less demanding, which might have led a greater proportion of families to enroll, even if they were hesitant or ambivalent about initiating treatment. The variety of activities and interactions between families and intervention providers throughout the obesity management interventions, combined with the non-randomized study designs, make it difficult to determine if any components of the orientation sessions influenced attrition. It is possible that orientation sessions reduce attrition, but these types of sessions are probably better suited to helping children and families decide about whether they should enroll in obesity management[38].

To our knowledge, no published reports have examined whether orientation sessions enhance treatment enrollment. Perez *et al.*[39] showed that children were less likely to enroll in multidisciplinary obesity management as the length of time increased between their orientation session date and initial clinic appointment. Unfortunately, their analyses did not extend into the intervention period to examine longer term effects on attrition. Because orientation sessions are common in multidisciplinary obesity

management clinics and interventions[35,36,39,40], research is needed to determine their value and impact on different engagement-related constructs (*e.g.*, enrollment, adherence, attrition)[13].

Several studies have documented the role that logistical factors play in families' decision to discontinue obesity management[19,41-43]. Transportation and parking costs, limited flexibility in clinic schedules, and work/school commitments have all proved challenging issues for families to overcome. Given these observations, we were surprised that our search did not yield any studies designed to help families overcome these practical issues. In adults, Pirotta *et al*.[27] found that financial incentives reduced attrition, which may have (at least in part) made it easier for some adults to participate in obesity management if incentives were used to offset expenses related to practical issues such as transportation and parking. Because many families face barriers to attending in-person appointments, obesity management interventions can be delivered in different ways to make it easier for families to participate. For example, families view home-based[44] and digital/online interventions[45] favorably and these modalities have the potential to improve accessibility to obesity management. The emergence of COVID-19 has required clinicians and health care systems to embrace the virtual delivery of health services care out of necessity due to social distancing measures[46]. As the pandemic evolves over time, virtual care may persist as a common mode of delivering obesity management care, which highlights the opportunity for research in this area. There are limited data that support the effectiveness of treatments delivered virtually[47], but these modalities have the potential to reduce the impact of logistical factors that can lead to attrition as either standalone or adjuncts to in-person interventions.

Interpersonal and social factors are often cited by families as reasons for attrition[18]. A lack of social support to continue obesity management can make it difficult for children and parents to persevere, especially when lifestyle changes influence the lives of family members who are not

motivated to make changes or who wish to maintain current lifestyle habits[48]. This resistance can be discouraging, highlighting the important role that intervention providers can play in providing social support for children with obesity and their families[49]. In this way, the text messaging strategies reported in two of our included articles provided parents with motivational prompts to enhancing goal setting (in the Armstrong *et al.*[32] study) and a structured mechanism for children to track and share their diet and physical activity habits (in the de Neit *et al.*[34]) with research staff. In both studies, participants had the opportunity to receive ongoing positive feedback and encouragement.

Self-monitoring (*e.g.*, tracking lifestyle habits and body weight) strategies were one of the main themes identified by Pirotta *et al*.[27] that reduced attrition in obesity management for adults. This activity enhances awareness of lifestyle habits over time, can inform goal-setting, and build rapport, all of which might be beneficial regarding attrition. Self-monitoring has a potentially important role to play in reducing attrition in pediatric obesity management, although additional data are needed to confirm the independent and synergistic roles of self-monitoring in the context of other strategies (*e.g.*, social support, frequency of contact with intervention staff) that can also impact attrition.

A positive and supportive relationship between families and professionals can play a valuable role to increase children's and parents' motivation and participation (*e.g.*, attendance, goal setting) in obesity management[49]. Regular, ongoing, and affirming communication between children and parents and intervention providers in the Armstrong *et al.*[32] and de Neit *et al*.[34] studies represent positive and validating interactions, which contrast with the weight bias and stigma that many individuals with obesity experience in the healthcare system[50]. We are not aware of any research linking attrition with families' perceptions of weight bias and stigma, but it is possible that training and education to reduce

the presence of weight bias and stigma among obesity management intervention providers could have a positive influence on attrition[51].

Many children and their parents choose to persist in pediatric obesity management interventions for a variety of reasons. For instance, families have reported positive interactions with clinicians, practical and hands-on educational sessions, and a family-centred approach to care as reasons for continued participation[18,52]. Continued attendance has also been the result of parental concern for their child's health, anticipated and actual benefits from treatment, and high quality of care, including tailored health services[18,53,54]. Ongoing attendance is supported by flexible work schedules, choice of appointment times, adequate family financial resources, and children's motivation[53]. A detailed assessment of family expectations and potential barriers to treatment at treatment onset can help clinicians to align their services with family preferences and needs[55-57], but prospective data are limited regarding how this assessment might reduce attrition.

Patient- and family-centered strategies that attend to multiple factors (*e.g.,* logistical, interpersonal, healthcare system) that are related to attrition have been evaluated in other areas of health care delivery. For instance, individuals with chronic diseases (*e.g.,* cancer, diabetes) can experience difficulty navigating the healthcare system; challenges can include accessing community-based services[58], attending in-person medical appointments[59], overcoming communication and information barriers[60], receiving in-home support and education[61], and transitioning from pediatric to adult care[62]. Such experiences have catalyzed research examining the impact of patient navigators on improving treatment access and outcomes[63]. Navigators could potentially serve supportive roles for children with obesity and their families during the course of obesity management, empowering families to access resources and services (*e.g.,* mental health support, community-based sport/recreation) that optimize

intervention impact, both within and beyond clinical settings. Navigators can also help families to achieve a more detailed and thorough understanding of complex health issues and treatment regimens for obesity management, which can be overwhelming for some families. Based on evidence from related fields, there is value in determining the potential benefits of navigators in reducing attrition in managing pediatric obesity.

We acknowledge that our review was not without limitations. First, the different study designs and variability in how attrition data were reported prevented us from quantifying the overall extent to which strategies can be expected to reduce attrition. Unfortunately, the data were not amenable to conducting a meta-analysis. Recently, heterogeneity in how attrition-related research is reported led us to propose a universal approach for documenting and evaluating attrition in managing pediatric obesity[64], which may help to standardize documentation and enable meaningful data syntheses in the future. Second, none of the studies included in our review documented reasons for attrition. A common underlying assumption in attrition-related research is that individuals discontinue obesity management because they are unhappy or dissatisfied (*e.g.*, unhappy with lack of improved weight or health, intervention failed to meet expectations, family members' priorities changed over time, motivation to participate decreased). However, some families discontinue obesity management because they were satisfied and received the care and support they desired[41], indicating that attrition should not be viewed universally as a negative outcome. This lack of resolution in the main outcome of interest suggests the true impact of the attrition-reduction strategies tested in the included studies remains unknown. Finally, the studies included in our review evaluated strategies that focused on practical issues, which presents some limitations. From an academic perspective, to better understand the impact of attrition-reduction strategies, the application of relevant theories and frameworks (*e.g.*, self-determination theory[65], behaviour change wheel[66], family systems theory[67]) have the potential to inform and improve strategy

design, implementation, evaluation, and dissemination. This approach also has the potential to help identify for whom and in what settings attrition-reduction strategies are effective.

Conclusion

Attrition in managing pediatric obesity is a common occurrence, but our findings provide some evidence that attrition has the potential to be reduced. The heterogeneity of approaches tested, small number of studies, sub-optimal study quality, and variable responses highlight the imperative for experimental studies to test the efficacy and effectiveness of evidence-based, theory-informed strategies designed to reduce attrition in managing pediatric obesity.

Potential Conflicts of Interest

The authors have no conflicts of interest to declare.

Author Contributions

GDCB conceived the study, interpreted the results, and wrote the first draft of the complete manuscript.
MS conceived the study, screened articles, assessed article quality, and wrote the first draft of the methods section.
JW screened articles and assessed article quality.
DKL developed, refined, and implemented the literature search strategy.
JH conceived the study and interpreted the results.
IZ conceived the study and interpreted the results.
AP conceived the study and interpreted the results.
JN conceived the study and interpreted the results.
JAS conceived the study and interpreted the results.
All authors reviewed, edited, and approved the final submitted manuscript.

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